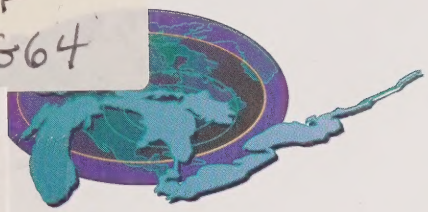


GREAT LAKES FACT SHEET

Great Lakes Coastal Wetlands – Science and Conservation

What defines a coastal wetland? For most people, there is little distinction between a swamp and a marsh or a bog. However, coastal marshes, temperate swamps and northern bogs are each unique ecosystems that support different species of plants and animals. All wetland types with a direct hydrological connection to the Great Lakes are considered Great Lakes coastal wetlands.

MORE AND MORE PEOPLE are recognizing wetlands as dynamic, productive and diverse ecosystems. Many visitors to Great Lakes wetlands immediately appreciate their natural beauty, experience the sense of tranquility they offer, and recognize their role in the local landscape. For others, wetlands are valued for their practical and crucial functions, such as erosion control and flood regulation. These special places are wildlife nurseries and nesting sites, feeding grounds and resting places, water filters and reservoirs. They help protect shoreline areas from storm damage and attract fish, birds, amphibians, reptiles and mammals. They are also great places for people to explore and reconnect with nature.

Unfortunately, wetland values are still not widely recognized. As a result, during the past two centuries, over two-thirds of southern Ontario's original wetland area has been lost. That number reaches 90 percent and higher in areas such as Ontario's southwest. Wetlands located in coastal areas of the Great Lakes are especially at risk due to high development pressure in urban areas, and stresses such as lake-wide water level regulation. Conservation policies and initiatives now exist throughout the Great Lakes basin to limit further wetland losses, and restore lost area and functions. However, conservation remains an uphill battle as losses continue.

To effectively conserve coastal wetlands, more must be known about their ecology, location and how they are classified. In addition, their values must be more widely accepted. Many wetlands are on privately owned property, affected by thousands of individual decisions.

The Canadian Wildlife Service prepared this fact sheet to convey the importance of coastal wetlands in maintaining the hydrological and ecological health of the Great Lakes ecosystem, and to encourage wider acceptance of wetland values.

Photo: Eric Dresser

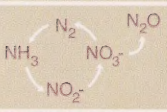
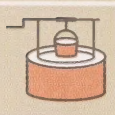
Environment Canada Environnement Canada

People need wetlands

Wetland Functions and Values

Functions and values are terms often used interchangeably when discussing wetlands. In fact, they have very different meanings. Functions include biological, chemical and physical processes that occur naturally within a wetland, such as nutrient cycling and ground water recharge. Values, on the other hand, are an estimate of the worth or importance of wetlands to humans. Values include recreation, flood control and water quality improvement.

A selection of functions and values provided by coastal wetlands

	Provision of habitat
	Filtration of water
	Flood retention
	Erosion reduction
	Recreation – canoeing, fishing, bird watching
	Harvesting – berries, grains
	Carbon storage
	Nutrient cycling
	Groundwater recharge

What Are Wetlands?

Wetlands are lands that are seasonally or permanently covered by shallow water, or land where the water table is close to or at the surface. The presence of water causes the formation of hydric soils and allows the dominance of water tolerant plant species.

There are four main types of Great Lakes coastal wetlands.

- **Swamps** are wetlands dominated by trees and shrubs, with standing water, limited drainage and often neutral or slightly acidic soils.
- **Marshes** are wetlands that are almost always flooded and are characterized by a mixture of cattails, reeds and other aquatic vegetation. Ninety percent of the wetlands located in Great Lakes coastal areas are marshes.
- **Bogs** are peat-accumulating wetlands which trap precipitation as the only water source, typically have acidic soils and water, and often contain Sphagnum mosses.
- **Fens** are peat-accumulating wetlands with groundwater as the dominant water source, and support a variety of specialized plant species, including orchids, sedges and grasses.

Photo: Eric Dresser

Photo: Matt Young

Photo: Lesley Dunn

Why are wetlands where they are?

OVER MANY YEARS, natural wetlands develop in the landscape, influenced by two main factors:

- What is the water source?
- Are adequate soils and sediments present that will provide the foundation for vegetation growth?

Water works

Without water, there would not be wetlands. Wetlands are adaptable ecosystems that thrive and depend on changing water levels and moisture conditions. Some wetlands are inundated with water year round, while others are flooded only seasonally. Depending on the source of water, very different wetlands can develop. Surface water fed wetlands are often nutrient rich due to runoff from upland forests and agricultural fields. Groundwater fed wetlands are often nutrient poor, but high in dissolved minerals. Precipitation fed wetlands are very nutrient and mineral poor, often preventing them from supporting lush vegetation communities.

The earth moves under your feet

The second important factor is the presence or absence of the soils and sediment that support coastal wetland development. This is largely shaped by local geology and geography. For example, the hard granite bedrock of the Canadian Shield that forms much of Lake Superior's shoreline results in far less erosion and sediment accumulation than softer, sedimentary rocks found along Lakes Erie and Ontario shorelines. As a result, features such as sand bars, spits and barrier beaches protect many wetlands in the lower lakes, while upper Great Lakes wetlands tend to be more exposed to lake influences due to less sediment accumulation.

What's in a name?

The term "wetland" is all-inclusive. Addition of the word "coastal" narrows the scope, however all coastal wetlands are not the same. Each one has its own unique set of attributes and resulting functions. Classification systems are developed to identify and categorize the different wetland types. Vegetation-based classifications of swamp, marsh, bog and fen are often not enough to describe differences between them. Hydrological (water) and geomorphic (land) features need to be included.

The classification scheme described here is one of several used throughout the Great Lakes. Within this scheme, there are three broad systems, each based on the predominant hydrologic influence on the wetland. Further division within these systems is also possible and required in many situations.

Lacustrine Wetlands

Lacustrine wetlands are predominantly influenced by lake forces, in protected bays or on a stretch of open shoreline. This photo and drawing illustrate open embayment wetlands. An example of a protected lacustrine wetland is Matchedash Bay on Georgian Bay.

Photo: Ted Cline

Riverine Wetlands

River processes control these wetlands, at river mouths and along major river channels. Examples are all wetlands on the St. Lawrence and St. Clair Rivers, and the many drowned river-mouth wetlands on Lake Ontario.

Riverine wetlands may be open or protected from the lake. The photo and drawing depict open drowned river-mouth wetlands.

Photo: Rouge Park Alliance

Barrier-Protected Wetlands

Barrier-protected wetlands are those that, due to coastal processes, have become physically separated from the Great Lakes by a barrier beach or a series of beach ridges. Both lacustrine and riverine processes may influence these wetlands.

Barrier beach wetlands are connected to the lake through ground water and/or periodic direct channel flow. Some barrier beach and other barrier wetlands are also influenced by the drainage of the wetland's individual watershed.

Photo: Maggie Young

Many barrier beach wetlands are found around Lake Ontario, including the one shown here in Prince Edward County, and Oshawa Second Marsh.

The rise and fall of the Great Lakes

GREAT LAKES WATER LEVELS have been monitored since the mid-1800s, revealing more than a century of consistent, natural variability. This data is supported by the historic record contained in sediments that depicts more than 5,000 years of natural change. In contrast, human influence has impacted Great Lakes water levels for a relatively short time. Lakes Ontario and Superior have been regulated at their outflows since the mid-1900s to permit consistent shipping and hydroelectric power production by reducing lake level variability.

Wetlands need changing water levels to maintain their productivity and diversity.

Both natural and human-induced fluctuations impact a broad range of wetland characteristics, ranging from water chemistry to plant community composition. Most often, vegetation is the first wetland component to be affected. This alteration then changes the fish and wildlife community.

Water level fluctuations impact not only wetland biology, but also the many other components that make wetlands dynamic and productive systems. Currents, wave action, turbidity, acidity, temperature, and nutrient content are all affected by changing water levels. For example, low water levels result in faster warming of wetland water and may result in unsuitable habitat for certain fish species. Conversely, high water levels may dilute nutrient and contaminant concentrations to decrease local toxicity to plants, fish and other wildlife.

Types of water level fluctuations and their impacts on coastal wetlands

Type	Cause	Magnitude	Duration	Impact on Coastal Wetlands
Short-term	Storms, and wind and atmospheric pressure-driven "tides" known as seiches.	0.5 metres (3 metres has been reported)	Usually less than one day	• Damage to vegetation due to high winds and waves.
Seasonal	Reflection of the yearly hydrologic (water) cycle in the Great Lakes basin. Lowest levels often occur in late summer, after evaporation has peaked.	30 to 50 centimetres	A few months	• Unpredictable and variable water levels result in the highest level of plant diversity. Many plants and animals are adapted to and depend on a highly changeable wetland environment. • Low water levels in the autumn expose wetland bottom sediments which allow the seeds contained there (in the seed bank) to germinate.
Multi-year	Basin-wide, continental or global climate changes that result in different patterns of precipitation and evaporation over a number of years. Also caused by human-induced water level regulation to facilitate shipping.	Up to 2 metres during the 20th century	More than one year	• High water levels can eliminate large areas of wetland by flooding. • Low water levels that expose mud flats with an extensive seed bank will allow wetlands to expand toward the new lakeshore.

Lake Ontario Water Level Regulation

Lake Ontario's water level has been regulated since 1960 to facilitate increasing demand for shipping and hydroelectric power. Unfortunately, what is good for shipping is not so good for coastal wetlands. Natural water level variability has been diminished, thereby reducing the biological diversity of coastal wetlands that depend on variability to maintain their vegetation communities.

Determining the criteria to control regulation of water level and flow in Lake Ontario and the St. Lawrence River, is a challenge being addressed through a binational study launched in 2001 by the International Joint Commission (IJC). The five-year IJC study provides a major opportunity to improve the understanding of past water regulation impacts on coastal wetlands. The new knowledge will be used to develop and recommend water level regulation criteria for the benefit of all interests, including the specific objective of maintaining coastal wetland diversity and health.

For more information on the IJC study, visit www.ijc.org.

Photo: Maggie Young

Wetland flora

ANYONE WHO HAS explored the natural shorelines of the Great Lakes has been struck by the diversity of wetland plants. Cattails, pond-lilies and grasses are plants that thrive in the wetland environment and represent the traditional marsh to many people. Wetland plants are classified into categories, or growth-forms, depending on their ability to grow in water. These distinctions are general, since most wetland plants – by necessity – can tolerate a range of water depths. However, there are four basic growth-forms.

- **Floating plants** are those that may be rooted underwater, but whose leaves float on the surface. These include Yellow Pond Lily *(Nuphar variegatum)* and duckweeds.
- **Submergent plants** are rooted under the water and grow entirely underwater, for example Wild Celery *(Vallisneria americana)* and Coontail *(Ceratophyllum demersum)*.
- **Emergent plants** are those species whose roots might be underwater, but which grow and flower above the water's surface. The most common examples include Cattail (*Typha* sp.) and Bulrush (*Scirpus* sp.).
- **Wet meadow/shrub plants** are those that grow above the water line where conditions allow. This area is still influenced by periodic flooded conditions. Plant types include shrubs, sedges, grasses and other herbs, such as the Spotted Touch-me-not *(Impatiens capensis)*, Leatherleaf *(Chamaedaphne calyculata)* and Meadowsweet *(Spiraea* sp.*)*.

Climate, bedrock, land use, and the lake influence vary markedly around the Great Lakes shoreline. As a result, every coastal wetland evolves as a unique community of plant species determined by local physical conditions.

Many coastal wetland plants have special habitat requirements that make them unique, and often hard to find, such as ....

Grass Pink

Prairie Fringed Orchid

Left photo: Doug Wilcox. Right photo: Canadian Wildlife Service

Other species are much more common ...

Clockwise from top left: White Water Lily, Pitcher-plant, Burreed, Northern Blue Flag Iris.

Photos (clockwise from top): Eric Dresser, Doug Wilcox, Kim Smith, Brian Branfireun

Wetland wildlife

Muskrat

Wood Duck pair

Wood Turtle

Photos: Eric Dresser

THE GREAT LAKES basin is home to hundreds of birds, mammals, fish, amphibians, reptiles and invertebrates (see table below), many of which rely on coastal wetlands for all or part of their life cycle requirements, including Species at Risk such as King Rail and Fowler's Toad.

Wetlands provide ideal habitats to foster diversity. The habitat gradient found in coastal wetlands ranges from standing water to dry land and includes every combination of both. This provides a wide variety of niches that fulfill the habitat requirements of many different species. Few ecosystems provide this many opportunities for different species to live together.

Beavers are ecosystem engineers – their dam building activity is responsible for the creation and maintenance of many inland wetlands. Similarly, muskrats, which thrive in cattail marshes, can clear large areas of vegetation for food and to build their domed shelters. In the process, they increase the amount of open water.

Many species depend on a mix of open water and emergent vegetation at a ratio of about one part open water to one part vegetation. This condition is known as a hemi-marsh. Open water allows birds, such as Great Blue Heron, a place to hunt, and waterfowl, such as Mallard, a place to land. Clusters of dense emergent vegetation provide nesting materials and cover for the eggs and young of many species. Similarly, most amphibians require a mix of shallow water and drier upland to complete their life cycle. In their juvenile stages, frogs, toads and salamanders hatch as water dwelling tadpoles and efts; however, as they grow, they seek dry land for mating and feeding requirements.

The unique attributes of wetlands make them home to many Great Lakes basin **Species at Risk** that use wetlands for a part of their life cycles. For example, two rare wetland amphibians – Blanchard's Cricket Frog and Fowler's Toad – are considered to be endangered and threatened respectively. Blanchard's Cricket Frog is at the northern edge of its range in southern Canada and has only been found at Point Pelee National Park (last observed in 1920) and Pelee Island (last observed in 1977). Fowler's Toad, also rarely seen in Canadian Great Lakes wetlands, is found only in isolated areas around Lake Erie.

The who's and why's of wetland wildlife

Wildlife group	Number of species found in Great Lakes wetlands	This group of wildlife uses coastal wetlands for...	Common species found in coastal wetlands	Examples of Species at Risk that depend on wetlands
Bird	over 100	nesting, breeding, feeding, migratory stopover	Red-winged Blackbird, Great Blue Heron	King Rail, Least Bittern
Amphibian	13	nesting and feeding, egg-laying, provide food for species higher on the food chain	Bullfrog, Spring Peeper, Northern Leopard Frog	Fowler's Toad, Blanchard's Cricket Frog
Reptile	approximately 12	breeding, feeding, basking	Snapping Turtle, Eastern Garter Snake	Eastern Spiny Softshell Turtle
Fish	100 native Great Lakes fish, many use wetlands	spawning, feeding, overwintering nursery habitat, cover from predators	Northern Pike, Walleye, Large-mouth Bass	Spotted Gar, Deepwater Sculpin
Invertebrate	hundreds	all aspects of life, provide food for all other levels of the food chain	Crayfish, Unionid Mussels, *Diporeia hoyi*	Wavy-rayed Lampmussel
Mammal	approximately 12	feeding, cover, shelter	Beaver, Mink, Moose	American Badger

Population decline

AS SHOWN in Figure 1 (below), preliminary data from basin-wide monitoring programs depict the population declines (and growth) that many species of marsh birds and amphibians are experiencing throughout the Great Lakes basin. There are many reasons for the declines – the most ongoing and detrimental being loss of habitat. For amphibians and many birds, a loss of wetlands is a loss of their food and shelter, as well as vital sites for nesting and hibernation. Draining and filling of wetlands and removal of shoreline vegetation and tree cover is a major threat to wetland integrity, and hence the wildlife that depend on them.

A reduction in the quality of wetland habitat through direct and indirect nutrient and contaminant pollution also impacts wildlife. The presence of high levels of some pollutants in the food chain, such as organochlorine compounds, increases the risk of effects in wildlife such as egg shell thinning, reproductive failure, and congenital deformities.

Population decreases seen in some species of migratory waterfowl and other wetland birds can often be attributed to diminished habitat quantity and quality in overwintering habitats in the southern United States, Mexico and Central America. Continental agreements such as the North American Bird Conservation Initiative (see page 10) are designed to minimize destruction of migratory bird habitat in all parts of North America.

Comparison of trends in wetland stresses and species population numbers may reveal direct linkages between a specific stress and population decline. For example, many birds depend on a specific mix of emergent vegetation and open water habitats that usually results from periodic, wide fluctuations in water levels. Long-term reduction of water level extremes, particularly for Lake Ontario, may be playing a role in diminishing habitat diversity and thus the size of these bird populations.

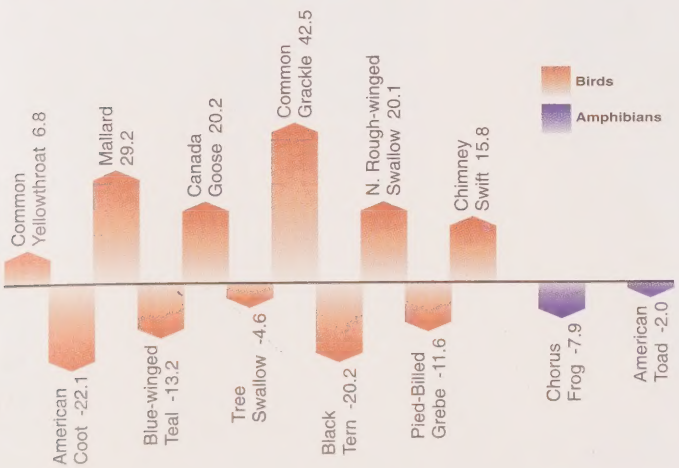
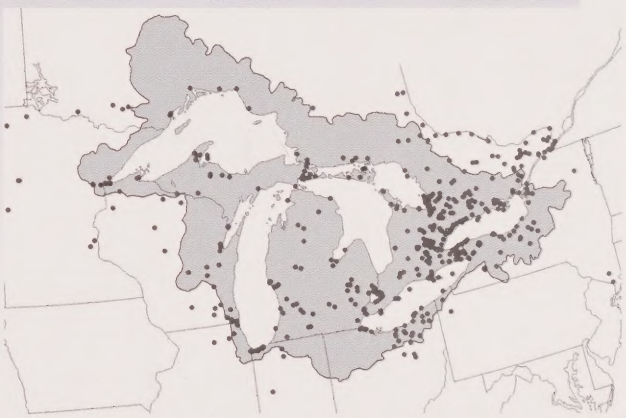


Figure 1. Bird and amphibian populations that showed significant positive or negative trends throughout the Great Lakes basin between 1995 and 1999. Percentages indicate the increase or decrease in population index over that time period.

The Marsh Monitoring Program

The Marsh Monitoring Program (MMP) is a key wildlife monitoring program for coastal and inland marshes in the Great Lakes basin, and its success has been fuelled by the energy and heart of volunteers. Established in 1995, the MMP is a volunteer-based binational program, coordinated by Bird Studies Canada in partnership with Environment Canada and the U.S. Environmental Protection Agency, that conducts regular surveys for marsh birds, frogs and toads. More than 500 volunteers have taken part in the survey, contributing more than 6,000 hours of their collective time. The survey information has already identified several significant trends, including the significant decline of Black Tern populations in Great Lakes coastal wetlands. All of the bird and amphibian trends presented on these pages originated from MMP data.

The MMP is always looking for new volunteers to monitor their local Great Lakes marsh. To learn more about this important and innovative program, visit their website at www.bsc-eoc.org/mmpmain.html.



Marsh Monitoring Program routes 1994-2001

Strength in Numbers

As the most diverse group of coastal wetland creatures, invertebrates (animals without backbones) are excellent indicators of coastal wetland health since they occupy a wide range of microhabitats and are relatively easy to collect and study. For example, the presence of certain dragonflies, damselflies and mayflies is often an indicator of a healthy and productive emergent plant community.

Photo: NOAA, Great Lakes Environmental Research Laboratory

A worm, lumbriculidae, and an amphipod, Diporeia, swimming at the sediment surface.

Wetland stresses

WETLANDS ARE UNDER STRESS at all times, from naturally occurring phenomena, such as storms, to human disturbances, such as draining and filling. Wetlands benefit from some degree of stress. For example, water level fluctuation can lead to increased diversity of plant communities. On the other hand, many stresses are detrimental to wetland area and functions.

Stresses can be direct or indirect. Direct stresses, such as draining and filling, originate in the wetland itself and are therefore easy to pinpoint. The causes of indirect stresses are often physically removed from a wetland. Indirect stresses include urban and agricultural runoff, and acid rain, which are difficult to control due to their diffuse and variable sources.

Indicators are an excellent way to assess the level of stress in different areas and to track improvement or deterioration. Binational (Canada-United States) Great Lakes programs are working towards implementing standardized monitoring systems for Great Lakes wetlands indicators. The State of the Lakes Ecosystem Conference (SOLEC) is a biennial conference hosted by Environment Canada and the United States Environmental Protection Agency that provides independent reporting on the state of health of the Great Lakes basin ecosystem. In addition, the Great Lakes Wetlands Consortium is a group of wetland scientists and policy makers dedicated to monitoring the condition of Great Lakes coastal wetlands. This effort involves validating indicators and developing methodology to assess the ecological integrity of Great Lakes coastal wetlands. For more information, visit the SOLEC (www.on.ec.gc.ca/solec) and Great Lakes Wetlands Consortium (www.glc.org) websites.

Figure 2. Stresses that impact Great Lakes coastal wetlands. Photos (clockwise from top): D.Jude, Carlter Haar, Randall McCune, Parks Canada, U.S. National Parks Service, John Mitchell. Centre photo: Eric Dresser.

Climate Variability and Change

Global climate variability could have a major impact on Great Lakes coastal wetlands. Global climate models predict that temperature changes will likely create atmospheric and hydrologic conditions that will significantly impact the levels of the Great Lakes. While estimates vary, some studies show that lake levels may drop from between 0.4 metres in Lake Superior to 1.0 metre in Lakes Huron and Michigan.

Great Lakes coastal wetlands are especially vulnerable to any fluctuation in water levels. The rate of the water level change, the magnitude of the change, the presence of a healthy seed bank, and the offshore slope of individual wetlands will determine the impact of such a change on the diversity and area of wetland vegetation.

Any change in wetland vegetation will have an impact on the fish and wildlife that depend on wetlands. Reduction in the proportion of open water in wetlands and an increase in dense emergent and wet meadow vegetation mean a loss of optimum habitat for some species of fish, waterfowl, and other marsh birds.

Despite an uncertain climatic future, coastal wetlands are resilient and stress-tolerant systems. Given the right combination of space to move, adequate timing and species adaptation, Great Lakes coastal wetlands will survive well into the 22nd century.

Visit www.great-lakes.net/envt/refs/cchange for more information.

Conservation of Great Lakes Coastal Wetlands

WETLAND CONSERVATION is a challenging and dynamic goal of individuals and organizations working with wetlands. Conservation is very broad and includes the collective contributions of wetland rehabilitation, creation and securement initiatives. Partnerships are an essential piece of the conservation puzzle. Through coordinated efforts, governments, non-governmental organizations and communities work together to rehabilitate and secure Great Lakes coastal wetlands.

Over 18,000 hectares of wetland have been rehabilitated (12,800 hectares) and secured (5,300 hectares) throughout the Great Lakes Basin.

Wetland conservation is carried out through many important mechanisms, each essential to lasting conservation. These include:

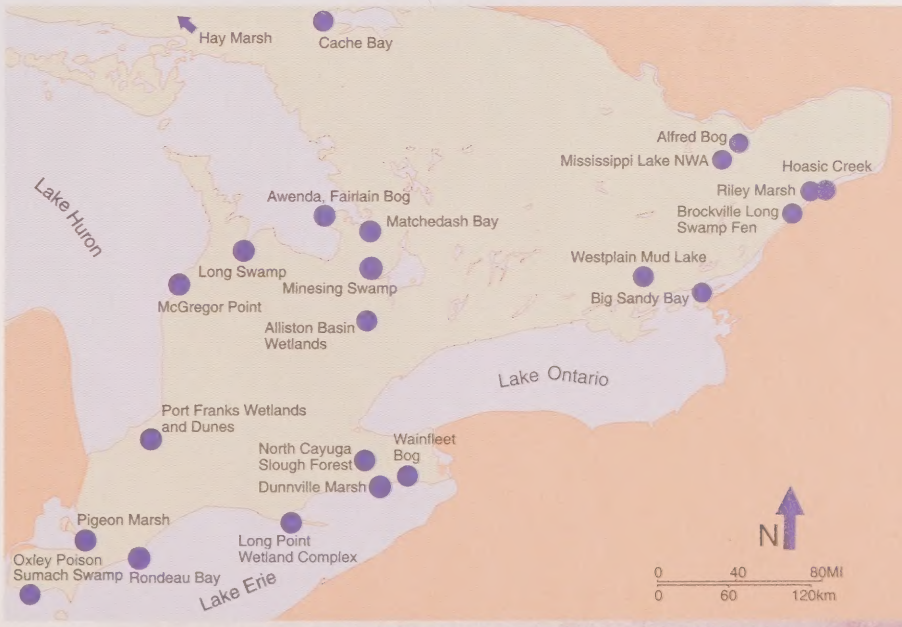
- Legislation, such as the federal *Fisheries Act;*
- Policies, including the Canadian Federal Government Policy on Wetlands Conservation;
- Agreements and treaties, such as the International Ramsar Convention on Wetlands and the Canada - United States Great Lakes Water Quality Agreement which called for the development of Remedial Action Plans (RAPs) and Lakewide Management Plans (LaMPs) to restore the ecological integrity of the Great Lakes;
- Landowner stewardship efforts, such as donation of ecologically sensitive land through the federal Ecological Gifts Program; and,
- Volunteer efforts, such as participation in the Marsh Monitoring Program.

The Great Lakes Wetlands Conservation Action Plan (GLWCAP)

GLWCAP was developed as the implementation mechanism of the 25-year Strategic Plan for Wetlands of the Great Lakes Basin. GLWCAP is a series of five-year plans, each with a set of goals that the partners aim to accomplish. The plan is implemented through a collaboration among wetland scientists and conservationists from Environment Canada, the Ontario Ministry of Natural Resources, Ducks Unlimited Canada, the Federation of Ontario Naturalists, and the Nature Conservancy of Canada. GLWCAP adopted eight strategies to work towards its goal of protecting the area and function of wetland habitat in the Great Lakes basin:

1. Increase public awareness and commitment to protecting wetlands;
2. Improve wetland science, data and monitoring;
3. Secure wetlands;
4. Create, reclaim, rehabilitate and manage wetlands;
5. Strengthen legislation, policies, agreements and compliance;
6. Strengthen local planning and commitment to protecting wetlands;
7. Improve coordination and planning among government and non-governmental organizations; and,
8. Evaluate the program.

The first five-year GLWCAP boasts much success in furthering Great Lakes wetlands conservation (see map). In 2002, the second GLWCAP is well into planning stages and beginning implementation. The focus of this plan will include increasing research on emerging wetland issues such as climate change and water level regulation, and maintaining the success rate of wetland rehabilitation and securement for which GLWCAP has become known.



Map 1. Wetland securement projects (1994 - 2001). The securement of these areas is thanks to the partners of the Great Lakes Wetlands Conservation Action Plan and the Eastern Habitat Joint Venture.

Partnerships for Conservation Success

Many wetlands remain through vigilant stewardship efforts by local groups and individuals.

WITH LIMITED FUNDING to go around, taking advantage of partnerships is essential for success.

- **Volunteers** provide much needed labour for planting and monitoring projects. To get involved, visit www.on.ec.gc.ca/wildlife/newsletters/watchers01-e.html.
- **Local groups** are often the most familiar with the history of their wetlands and can provide monitoring expertise and insight to the potential future uses of a newly rehabilitated wetland.
- With **private landowners** controlling much of the shoreline of the Great Lakes, their cooperation through donation of land, allowing rehabilitation efforts on their property, or personal stewardship efforts makes conservation possible.
- **University research** often uncovers new insights into the intricate dynamics of local wetlands, which can better direct rehabilitation efforts.
- **Elementary and high school** groups across the Great Lakes basin are involved in planting wetland vegetation, and even grow some of the seedlings in their own class rooms.

National Wildlife Areas

Photo: Tim Hagen

Long Point

The Canadian Wildlife Service owns and manages a network of 48 National Wildlife Areas (NWAs) across Canada. They contain a wide diversity of habitat of both national and even international importance. NWAs protect and manage critical habitat, including wetlands, for migratory birds and other wildlife, provide sites for public education and research and, in most cases, provide for limited public use. In Ontario, there are 10 NWAs, all in the Great Lakes basin, with seven located in association with the Great Lakes shorelines. These range in size from 0.8 hectares (Scotch Bonnet Island NWA in Lake Ontario offshore from Prince Edward County) to 3,250 hectares (Long Point NWA located on the north shore of Lake Erie).

For more information on National Wildlife Areas, and the NWAs located in Ontario, please visit www.cws-scf.ec.gc.ca/hww-fap/nwambs/nwambs.html.

Eastern Habitat Joint Venture

The North American Waterfowl Management Plan (NAWMP) was initiated in 1986 by the governments of Canada and the United States in response to serious declines in waterfowl numbers and wetland habitat losses. Mexico became a signatory to the plan in 1994, making NAWMP a truly continental conservation effort. The Eastern Habitat Joint Venture (EHJV) is one of 14 habitat 'joint ventures' established across the continent under the auspices of NAWMP. In Ontario, the EHJV is a partnership of the federal government, the provincial government, Ducks Unlimited Canada, the Nature Conservancy of Canada, and Wildlife Habitat Canada.

Some programs are applied on a broad scale to influence land use policies and promote ecologically sound and sustainable land use practices. Other programs are tailored to secure, create, restore or rehabilitate balanced habitat conditions for waterfowl and other wetland wildlife. Since NAWMP's inception in 1986, Ontario's EHJV partners have legally secured/protected roughly 115,000 hectares of wetlands (and adjacent uplands) in the Great Lakes-St. Lawrence region.

For more information on NAWMP and the EHJV visit www.nawmp.ca.

Ecological Gifts Program

Many private and corporate landowners have conserved wetlands by donating them to government and non-government conservation organizations. Other landowners have placed land use restrictions on the title of their property by donating conservation easements. The Ecological Gifts Program of Environment Canada recognizes such efforts – by certifying their land donations as ecological gifts donors can receive enhanced income tax benefits. To date, over half of all ecological gifts in Ontario (57 of 91 gifts) protect wetland habitat. For more information visit the Ecological Gifts website at www.on.ec.gc.ca/ecogifts.

North American Bird Conservation Initiative

Photo: Eric Dresser

Virginia Rail

Conservation efforts for waterbirds are now to be coordinated in a North American framework. Because of its mandate to conserve migratory birds, the Canadian Wildlife Service has played a primary role in the development of the North American Bird Conservation Initiative (NABCI). This coordinated effort among Canada, the United States and Mexico has as its goal to maintain the diversity and abundance of all North American birds. This strategy is essential to waterbird success since many species rely on wetland habitat not only in Canada, but throughout the continent.

NABCI seeks to coordinate conservation efforts for shorebirds, landbirds, waterfowl and waterbirds. Many species within each of these four groups of birds rely on wetlands to fulfill a part of their life cycles. For more information, visit www.nabci.org.

Lakewide Management Plans

The Governments of Canada and the United States, along with provincial, state, and municipal governments, and non-governmental organizations, have come together to ecologically restore each of the five Great Lakes. The 1987 Protocol to the Great Lakes Water Quality Agreement called for Lakewide Management Plans (LaMPs) to "embody a systematic and comprehensive ecosystem approach to resorting and protecting beneficial uses".

There are currently four LaMPs in progress – in Lakes Ontario, Erie, Superior, and Michigan. Conservation and rehabilitation of wetlands is integral to the work of the LaMPs to improve degraded fish and wildlife populations and restore lost fish and wildlife habitat. For more information, visit www.on.ec.gc.ca/glimr/program-LaMPs.html.

Wetland rehabilitation

PROTECTION OF THE FUNCTIONS and values of coastal wetlands that benefit humans every day is frequently challenged by the many stresses imposed upon these resilient ecosystems. In response to this decades-old conflict between conserving and developing wetlands, governments, community groups and non-governmental organizations around the basin are taking action to rehabilitate Great Lakes coastal wetlands.

Think first...

Successful rehabilitation depends upon a great deal of conceptual planning, research and design flexibility. There are many things to consider, including:

It is not only important that a rehabilitated wetland looks like a wetland, it must also function as one.

- the position of the wetland in the surrounding watershed;
- the presence and/or quality of a seedbank, or a natural source in the area that allows for recolonization of vegetation;
- the connection between the wetland and the regional water table;
- the underlying sediment; and,
- the need for water level variability to maintain new wetland vegetation communities.

...and act later

After an often lengthy planning stage, there is much to be done on the ground (and in the water). Rehabilitation must frequently address different problems in one wetland.

- **Hydrological rehabilitation** may encompass re-establishing natural water level variability through the use of dykes or creating new channels for directing water through the wetland.
- **Biological rehabilitation** includes altering existing habitat to encourage the settlement of desirable plants and animals. For example, increasing the ratio of open water to vegetation will increase overall plant diversity and satisfy habitat requirements for the most diverse number of species. Further, by controlling undesirable exotic species such as Purple Loosestrife, more beneficial species are able to thrive.
- Sometimes an excess of nutrients or toxic contaminants impedes a wetland's ability to regenerate. The most effective means of **chemical or contaminant rehabilitation** involves reduction at the source, such as decreasing fertilizer application to agricultural lands or reducing discharge from a sewage treatment plant. In cases where a point source cannot be located, rehabilitation in the wetland is required. This is referred to as *in situ* rehabilitation and includes controlled processes such as capping or carefully removing contaminated sediments.

A second chance for Second Marsh

A natural haven in the city, Oshawa Second Marsh is the largest remaining coastal wetland in the Greater Toronto Area and is home to a wide diversity of birds, amphibians and mammals. Since the early 1970s, human activities have caused significant degradation of this provincially significant cattail marsh. Alteration of the natural barrier-beach and water level regulation had caused a dramatic decrease in wetland vegetation and wildlife diversity.

In response to this degradation, the last decade has seen a regeneration of Second Marsh, spurred by the action of the City of Oshawa, industry, local groups, volunteers, non-governmental organizations and government partners. Cooperation, in combination with Environment Canada funding through programs such as Great Lakes Sustainability Fund and EcoAction, has allowed the re-establishment of natural hydrological connection to the lake, re-establishment of emergent vegetation, and protection from carp (often destructive to vegetation) entering the wetland.

Future projects include the creation of a water control system that allows management of wetland water levels in a manner reflective of natural processes. This will promote long-term sustainability of the wetland's rehabilitation.

For more information, visit:

www.secondmarsh.com

sustainabilityfund.gc.ca
www.ec.gc.ca/ecoaction

Photo: Joel Ingram

Oshawa Second Marsh

Eric Dresser

Common Yellowthroat

Rehabilitation Vocabulary

- **Rehabilitation** – Improvement of the functions or values of a degraded wetland.
- **Restoration** – Modification of the existing function and structure of a wetland's habitat so that it is similar to historical conditions.
- **Creation** – The conversion of a persistent upland vegetation community or ephemeral shallow water area into a permanent wetland where no previous wetland existed.
- **Enhancement** – Activity that addresses wetland stresses or limitations in order to improve one or more wetland functions or values.

What does the future hold?

Photo: Glenn Barrett

At Point Pelee on Lake Erie, the area's wetlands were found to have an annual recreational value of more than four million dollars, thanks in large part to the birdwatchers who flock to this famous avian migratory stop-over.

GREAT LAKES coastal wetland science and conservation have come a long way. The ecological, social and economic values of wetlands are gaining widespread recognition across Canada by the public and governments alike. At the same time, researchers are uncovering new insights into the complex, interwoven nature of wetland hydrology and ecology. Moreover, government funding, programs and guidelines are contributing to the conservation and rehabilitation of wetlands throughout the Great Lakes basin.

Science and monitoring play a critical role in the development and implementation of environmental policy in Canada. Further, wetlands and the functions they provide cross an increasing number of statutes, policies and programs delivered by Environment Canada. To address this growing requirement, the Canadian Wildlife Service of Environment Canada is expanding its wetland science and monitoring capacity through active participation in binational programs such as the Great Lakes Wetlands Consortium, the IJC Lake Ontario – St. Lawrence River Study and SOLEC. While the many values and functions of wetlands are increasingly clear, the difficulty often encountered by wetland scientists and conservationists is in communicating these functions and values in a way that will be understood and appreciated by landowners, governments and the public.

One of the most common ways of demonstrating the value of something is by quoting a price. But what is the price of a wetland? Our ability to answer and publicize the results of this question is becoming one of the key mechanisms to enlist support for wetlands conservation. An entire branch of economics has emerged that is devoted to the assessment of ecological value. Another Great Lakes Fact Sheet, *Putting an Economic Value on Wetlands – Concepts, Methods and Considerations,* describes in detail many of the methods and considerations involved in valuing wetlands. It can be found at www.on.ec.gc.ca/wildlife/publications-e.html.

Despite the many advances and increased awareness, coastal wetland losses continue. These losses highlight that there is more that can, and should be done to increase our understanding and protection of Great Lakes coastal wetlands. Now and in the future, multi-partner coordination will help to avoid duplication of research, and take advantage of the breadth of knowledge held by wetlands scientists in all Great Lakes jurisdictions. This cooperation will improve conservation and rehabilitation efforts in Great Lakes coastal wetlands, efforts that support the countless wetland functions and values upon which humans, fish and wildlife rely.

General Educational Themes

Wetlands
Chemical Contaminants in the Great Lakes
Habitats and Communities
Interactions Within Ecosystems
Biology and Wildlife
Endangered Species in Ontario
Human-Environment Interactions
Water Systems

Great Lakes Fact Sheets

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About the Canadian Wildlife Service

The Canadian Wildlife Service of Environment Canada manages wildlife matters that are the responsibility of the federal government. These include protection and management of migratory birds, nationally significant habitat and endangered species, as well as work on other wildlife issues of national and international importance. In addition, the Canadian Wildlife Service does research in many fields of wildlife biology. In 1997, the Canadian Wildlife Service (formerly the Dominion Wildlife Service) celebrated its fiftieth year.

Visit the Canadian Wildlife Service Wetlands website!
www.on.ec.gc.ca/wetlands

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